

**OECD Workshop on Extended & Shared Product Responsibility:
Economic Efficiency and Environmental Effectiveness
Washington, D.C., USA
December 1-3, 1998**

SUMMARY OF WORKSHOP - PREPARED BY THE US EPA

The following is a summary prepared by the U.S. EPA of the presentations made during the third in the series of OECD workshops on extended producer responsibility (EPR). This workshop, entitled “Economic Efficiency and Environmental Effectiveness” is part of the third (stakeholder input) phase of OECD’s research program on EPR. The final outcome of the OECD research program will be a guidance document for governments considering establishing EPR policy.

This report is intended to highlight the proceedings rather than act as meeting minutes or a formal proceedings document. Papers submitted by the panelists detail the presentations.

SESSION 1: OPENING

Mike Shapiro (Environmental Protection Agency, USA) welcomed the workshop participants and acknowledged the importance of EPR as an issue and the guidance document for governments that the OECD is developing. He acknowledged the variety of problems, products, politics, and existing waste management infrastructures that lead the different EPR program approaches as evidenced by the various countries in attendance at the workshop. He described the philosophy of the U.S. EPA towards EPR as an approach that looks to all the actors in the product chain to share responsibility for the life-cycle impacts of products. He expressed his interest in learning from others’ experiences throughout the workshop’s proceedings and his gratitude in being a participant in the OECD’s EPR effort.

Jean Cinq-Mars (OECD) reviewed the context for the workshop and highlighted that the aim of EPR is to reduce the environmental burden of production and consumption, thereby decoupling economic improvement from waste generation.

Given that a high percentage of OECD member countries already have some type of EPR program for batteries, tires, packaging, electronics, vehicles, or paper, the OECD is, through this workshop, examining whether EPR as a policy is economically efficient and environmentally effective. The outcomes of this workshop will add to the practical guidance offered in the manual the OECD produces.

Reid Lifset (Yale University, USA) presented three points relating to EPR:

Mr. Lifset pointed out that when discussing EPR concepts, “upstream” and “downstream” are

mentioned often. It isn't always clear what is being referred to—upstream or downstream what?activities of producers? ...environmental benefits? Use of these terms should be more specific.

He informed the audience of a technological advancement that has implications for EPR. An electronic data log was developed that records the usage history of an electric motor. The device allows the manufacturer to download information that can be used to decide whether the motor is worth disassembling to recover parts. This device for commutator motors could have a large impact on the electrical scrap market. Mr. Lifset questioned whether this type of technological innovation could be driven by the existing EPR programs or by unit-based pricing.

Lastly, Mr. Lifset urged more thinking about where the highest impact from products occurs. He questioned whether the largest impacts come from the waste management stage as opposed to the raw material extraction or use stages. He stressed that simple cost shifting doesn't achieve the goals of EPR and that there needs to be incentives to move toward innovations that reduce upstream impacts as well.

SESSION 2: EXAMINATION OF EPR APPROACHES AS APPLIED TO DIFFERENT INDUSTRY SECTORS, PRODUCTS OR WASTE STREAMS

Ulf Jaeckel (Ministry of Environment, Germany) provided a review of the different EPR systems for various products in Germany. These approaches include regulations, voluntary commitments by industry, and a mixture of both voluntary and mandatory initiatives.

EPR systems in Germany include:

- Packaging ordinance
- Regulations for drink packaging
- Ordinance for old batteries
- Draft ordinance for used information technology products
- Voluntary commitment for newspapers and magazines
- Voluntary commitment for scrap cars
- Voluntary commitment for building rubble

Based on the experience in Germany, Mr. Jaeckel outlined what he believes are ten key elements of successful EPR programs. These elements include:

- *Clear targets*—governments must set clear targets that can be accepted by all stakeholder groups

- *Clear addressing of responsibilities*—responsibility for the used product, which has become waste, should be clearly assigned
- *Situation related approach*—systems may vary between voluntary commitments and mandatory regulations depending on many factors, such as differences in products, market structure, targets, and value of secondary materials.
- *Financial incentives*—if waste management costs are internalized at the point in the product chain where the responsible party has the biggest influence on product design, there are clear financial incentives to change product design to minimize waste
- *Neutral to competition*—obligations should be addressed to all competitors and there should be no room for free riders
- *Differentiation between materials*—licensing fees that reflect the differentiation in the costliness of recycling can create incentives to change product design and materials
- *Encouraging competition in the waste management sector*—competition can help to control costs
- *Consumer participation*—EPR systems for household waste require the participation of consumers, therefore environmental awareness and easy access to collection and recycling systems are necessary
- *Use of Life Cycle Analysis(LCA)*—LCA can lead to the environmental optimization of products and greater acceptance of obligations
- *Monitoring*—without monitoring, there is no pressure to meet targets and goals might go unmet

Victor Bell (Environmental Packaging, USA) discussed issues related to the administrative costs of EPR programs. Mr. Bell's presentation centered on the high costs that manufacturers experience when complying with the reporting requirements of the various EPR packaging programs. These costs are driven by the amount of data that is required by each country, differences in reporting requirements among countries (i.e., material definitions that vary by country), and the fact that these requirements are continually changing.

Mr. Bell's recommendations to reduce the burden of EPR reporting requirements include:

- *Standardizing definitions*—this would reduce data requirements when companies sell their products in a number of different countries. Having a uniform recycled content standard would send a clear message to manufacturers on how to improve the recyclability of their products
- *Limiting the data required for each report*—countries should require only those data elements that are useful and will encourage change
- *Limiting fees to a weight and material basis*—fees based on shelf area or volume add to the cost of reporting and have little or no impact on packaging design
- *Minimizing the number of reporting entities*—since it is the product manufacturer that makes packaging design decisions, diluting packaging fees among additional sectors reduces the economic incentive to modify packaging

- *Minimizing the number of reports required per country*—countries should reduce the number of reports through quarterly or annual reporting. Also, allow third party organizations to accept fees and reports for all material types and all types of packaging (e.g., primary, transport)
- *Reviewing other legislation*—countries should monitor other’s legislation and consider the impacts on and/or consistency with their own packaging programs and EPR goals
- *Keeping programs simple and sending a clear message*—simple straightforward programs send the clearest messages, cost the least to comply with, and are the easiest to administer

Jacques Fonteyne (ERRA, Belgium) discussed the differences between packaging-related extended producer responsibility policies in Belgium and the Netherlands. He contrasted these systems implementing the EU packaging and packaging waste directive as a mandatory structure in Belgium and a shared responsibility approach (negotiated agreement) in the Netherlands. The systems were compared using the five performance criteria outlined by the OECD in the framework report:

- *Environmental effectiveness*—this is difficult to assess although Mr. Fonteyne reported that higher recovery and recycling rates are achieved in the Netherlands. Both countries have achieved effective public participation.
- *Economic efficiency*—interpretations of the data for many economic elements are uncertain and therefore, efficiencies could not be calculated; but, he stated that the recovery rates were higher in the Netherlands for a similar cost in total waste management. He felt that other differences indicated that Belgium had a less efficient system, such as the sizable bureaucracy, specific labeling requirements, subsidized secondary material prices, which influence internal and international competition.
- *Innovative advancement* —he believes that in both countries the impact on package design is just an enhancement of existing trends, and the impact on innovation in municipal solid waste management has been positive.
- *Political acceptability*—the Netherlands consensus building process achieves political acceptability but requires attention by all parties, while the Belgian command and control approach has not created consensus among the stakeholders.
- *Administrability*—the Belgian approach is complex, requiring at least 100 people to run it, while there are only 8 people monitoring the Dutch program.

Mikio Shoji (Keidanren, Japan) presented the Japanese industry’s views on Japan’s initiatives related to EPR. Mr. Shoji presented examples of voluntary programs that Japanese industry is currently undertaking including the recycling of automobiles. He reported that auto manufacturers are devising systems that facilitate dismantling, and investigating the selection of materials that are easy to reuse.

Japanese industry believes that the solution to the problem of recycling wastes lies in each

segment of society—consumers, business operators, and national and local governments—carrying out the roles that they are obliged to play. This shared responsibility is part of the Containers and Packaging Recycling Law and the Specific Household Appliance Recycling Act. In implementing these laws, several factors were considered when determining how responsibilities and costs would be shared. With respect to implementing the packaging law, Japanese industry felt that households should bear some direct costs at the time of collection to better influence disposal patterns. For appliances, Japanese industry believed if the consumer paid for recycling at the end of life, this would encourage consumers to extend the useful life of appliances through proper care and regular maintenance.

He stated that industry believes it must be key player by designing products for recycling and developing recycling technologies. Industry must also reduce life cycle environmental impacts of products as much as possible and identify wastes as resources and recover them. He believes industry should respond on a voluntary basis and requested voluntary action plans from each industrial organization. He received plans from 37 industrial organizations, which included quantitative targets for the reduction and recycling of wastes.

Mr. Shoji concluded his presentation by making three points:

- There is a wide variety of possible approaches for EPR, and there is no prescribed, uniform approach in Japan
- The OECD guidance manual should specify the responsibilities that exist not only for industry but also for governments and consumers in terms of who will have to take action for collecting and recycling, and who will bear direct costs
- EPR is one policy option for promoting recycling; but there are other policies, such as voluntary efforts and removing regulatory barriers, that can provide a response

Charlie Lund (Western Canada Used Oil/Filters/Container Task Force, Canada) described the used oil management program in Western Canada. Three provinces, Alberta, Saskatchewan, and Manitoba, have programs to take back used oil, oil filters, and containers from “Do-It-Yourself” oil changers such as consumers, farmers, and small commercial operations. Industry designed this program after government challenged them to find a voluntary solution to the problem.

The program is funded through fees collected on sales from wholesale suppliers (first sellers) of oil, oil filters, and oil containers. The funds collected are used to cover the cost of collection and recycling. Consumers return used oil, filters, and containers to designated public collection centers, many of which are at existing bottle collection depots.

The program has created a effective and efficient product stewardship by industry and has proven better than other alternatives considered including a deposit-refund system, a “return to retail” system, and a mandatory recycled content standard for oil and filters.

Clare Lindsay (US EPA) gave a lunchtime presentation of her paper discussing how voluntary partnerships can work towards the goals of EPR. She discussed how existing US EPA voluntary partnership programs between government, industry, and other stakeholders are promoting EPR in the US. Since the primary goal of EPR is to drive product design changes that minimize environmental impacts, EPA believes that a cooperative, challenge-oriented approach is better than relying on prescriptive mandates. Companies can devise efficient and effective solutions in given maximum flexibility within a set of guidelines. They are likely to act in their “enlightened self interest” and seek the cost savings, improved corporate image, reduced liability, increased competitiveness, product innovation and quality improvements that can accrue by greening their products. Governments benefits from lower administrative costs and other spillover benefits.

SESSION 3: TYPES OF EPR APPROACHES: MANDATORY, NEGOTIATED OR VOLUNTARY

Masuru Tanaka (National Public Hygiene Institute, Japan) gave an overview of two laws enacted in Japan to increase recycling. In 1995, Japan enacted the Packaging Waste Recycling Law that requires consumers to sort packaging for separate collection by the municipality. Manufacturers are then responsible for recycling the packaging themselves or paying a third party to recycle it. Under this system, manufacturers can lighten their own economic burden by cutting down on their containers and packages.

A second law that was enacted in 1998 was the Home Electric Appliance Recycling Law. This law obligates home electric appliance manufacturers to recycle their products. It initially targets televisions, refrigerators, washing machines, and air conditioners. Consumers disposing of an appliance are to return it to retailers and pay a fee that covers the collection, transportation, and recycling costs. The retailers return the products to the producers for recycling.

Mr. Tanaka concluded by summarizing his view of the changing external conditions related to waste disposal:

- as the need for more extensive recycling grows, residents have to be more involved and active for efficient and effective separated collections to be successful
- the destinations to which waste is to be brought may become widely varied as recycling facilities for various materials are developed
- many new recycling techniques and technologies have been developed and will continue to develop to meet the needs of future recycling plans
- the widespread focus on global environmental problems spur the public to demand waste disposal systems that reduce energy consumption and other environmental impacts

Kees Clement (Ministry of Environment, Netherlands) described the conditions for a successful EPR policy based on experiences in the Netherlands. He outlined four key elements in applying EPR:

- *Make a clear policy framework*—he advocates consensus building between industry and government based on a clear theoretical framework. He believes an active policy on the part of governments, with both carrots and sticks is necessary to get results.
- *Be clear on goals and means*—having well-defined goals is paramount. Prescribing how goals will be met is not that productive. Industry is able to choose an appropriate mixture of instruments to achieve the goals since they are the ones that have to actually implement them.
- *Be clear on responsibilities*—responsibilities have to clearly assigned. Governments must demand that the goals are met by those who are responsible; even if the initial set of instruments selected to achieve those goals is not successful.
- *Make the system waterproof* (i.e., individual obligations and monitoring)—free riding must be impossible so the attainment of goals is based on individual obligations for all producers.

Mr. Clement reviewed the Dutch experiences with EPR policies on packaging waste, end-of-life vehicles, and white and brown goods. He outlined the structure of the programs, including the nature of the laws, the goals, the responsibilities, and the results.

In conclusion, Mr. Clement stated that the Dutch policy is the result of a long period of intensive action of government and of cooperation with industry in which the point of departure is voluntary action by industry. In the Dutch policy there are well-defined goals, which make it possible for industry to choose their own means. However, one actor should take primary responsibility for the whole process. He believes that logically, this actor should be producer or importer—the one with the most influence on the whole process. He further believes that if voluntary systems don't meet the goals, the government should not hesitate to enact mandates.

Lynn Scarlett (Reason Foundation, USA) outlined three categories of voluntary programs that have been undertaken in the U.S. and embody the features of EPR including:

- *Take back and product leasing*—Individual companies or specific industries have set up mechanisms to take back products directly or through a collection network (e.g., Rechargeable Battery Recycling Corporation).
- *Consortia for green design, recycling, and remanufacturing*—Collaborative research efforts have focussed on environmental challenges like product reuse, recycling, and disposal (e.g., trade association efforts such as those by the American Forest and Paper Association, the Steel Institute, and the American Plastics Council).
- *Producer agreements/collaboration with private-sector suppliers*—Manufacturers have used their leverage as buyers to encourage their suppliers to “green” the inputs to the

manufacturing process, thereby investing in upstream product redesign efforts (e.g., Dell's establishment of Environmental and Recyclability Design Guidelines for all input suppliers and Hewlett Packard's "Controlled Materials List").

Ms. Scarlett outlined four challenges common to these programs including encouraging customer participation, establishing efficient collection networks, identifying end markets and uses, and achieving industry cooperation.

Through an informal survey of industry voluntary programs, Ms. Scarlett identified three motivations for program start-up in the face of these challenges, including:

- *Regulations*—including indirect regulatory motivations that do not require product take back but make such arrangements more economically attractive (e.g., by avoiding hazardous waste and liability concerns).
- *Economics*—where there are clear economic benefits to customers
- *Image-building*—when the voluntary actions help attract and maintain customers.

Ms. Scarlett points out that voluntary EPR programs are situated within a larger market context. Sustainability of these programs hinges on cost effectiveness. All programs surveyed placed a premium on integrating economic concerns with environmental goals.

Ms. Scarlett feels that a number of factors appear to influence the likelihood that voluntary EPR programs will emerge:

- Number of affected products within a target category
- Frequency of product transactions
- Degree of product homogeneity within a product category
- Size and scope of a product distribution network
- Degree of harm (liability) associated with product mishandling in use and disposal
- Nature of existing discards/handling infrastructure
- Number of manufacturers within an industry
- Availability of consumer incentives/disincentives for appropriate product use and disposal or recycling

Pat Layton (American Forest and Paper Association (AF&PA), USA) discussed the success of programs voluntarily undertaken in the paper industry to meet environmental goals. In 1990, the U.S. paper industry set a goal to recover 40 percent of all paper used in the U.S. in 1995. This goal was met in 1994 and the industry set a new goal to recover 50 percent of all paper.

Ms. Layton described three stewardship initiatives that demonstrate the industry's commitment to environmental improvement and conservation of natural resources:

- *Corrugated*—The AF&PA established relationships with trade associations and

researched the economics of wax corrugated box recycling. AF&PA discovered that it was uneconomical to take back wax corrugated to make new paper, but that the material could be used to make other products. AF&PA worked with the Food Marketing Institute to improve box markings and sorting to facilitate wax corrugated box recovery and recycling.

- *Paper Grocery Bags*—Among several programs to promote the reuse and recycling of paper grocery bags in homes and communities, is the Billion Bags Campaign, which encourages families to reuse and recycle paper grocery bags and boxes. A second program, America Recycles Day, uses paper grocery bags as billboards to encourage recycling.
- *Newsprint*—The AF&PA has experienced success in their newspaper recycling programs. In 1997, 67 percent of old newspapers (ONP) was collected in the U.S. AF&PA members have used partnerships to increase the capture of ONP material for recycling. For example, one AF&PA member initiated a program that placed 21-foot containers at nonprofit organizations (mainly churches and schools) to collect additional ONP. They donate the proceeds from the ONP to the organizations where the collection takes place.

Ms. Layton states that these examples show that a voluntary partnership of industry and consumers, tailored to meet local needs, can achieve impressive successes.

Allen White (Tellus Institute, USA) described the concept of “servicizing” as when an enterprise transitions from a product- to a service-based organization or a firm delivering value through sales of a service or a function, rather than a physical good. For example, instead of buying a refrigerator or a computer, customers would purchase the refrigeration or information processing services that such products enable. Once the quantity or quality of such functionality deteriorates or the technology changes, customers will switch products. Examples of servicizing include office equipment leasing and “rent-a-chem” programs.

This approach can be linked in concept to the goals of EPR to the extent that manufacturers, under such a system of functional delivery, maintain ownership of the actual equipment and therefore automatically take it back, repair, or upgrade it in the course of delivering the “service” to the customer.

Mr. White points out that “servicizing” is a trend that is occurring on its own in business today, due to motivations that are unrelated to environmental concerns. Through careful policy development, governments could attempt to influence these emerging market trends to exploit potential environmental gains that could accrue from servicizing.

Takashi Kitaba (Ministry of Health and Welfare, Japan) presented an overview of Japan’s approach to EPR. He explained that since Japanese land suitable for final disposal sites is in such short supply, there is an urgent need to shift waste management from incineration and landfilling, to reduction and recycling.

He explained that there are currently no mandatory requirements for producers to green their products. Therefore initiatives by individual firms have been voluntary. There are, however, some requirements in place or being considered for packaging and some end-of-life products.

Mr. Kitaba summarized how Japan is approaching the management of specific end-of-life products. Currently, about 80 percent of discarded large electrical and electronic appliances are taken back by retailers and managed by waste treatment companies. Because the level of recycling actually taking place was low and increasing numbers of retailers were refusing to take back products, the Electrical and Electronic Equipment Recycling Law was enacted and will obligate retailers to take back products and producers to recycle them beginning in 2001. The cost of collection and recycling will be funded by fees paid by the consumer at the time they take the product back to the retailer. The fees collected will be high enough to cover the costs of recycling orphan and existing products.

In 1991, a law was enacted to promote the use of recycled materials. The law included requirements for marking bottles, cans, and batteries to facilitate collection; developing recycling plans and targets for paper, glass, and construction debris; and considering design changes for motor vehicles, electrical appliances, and other items to facilitate disassembly.

Also, the Packaging Recycling Law requires residents to separate packaging waste and municipalities collect it. Producers and bottling companies are responsible for recycling the materials collected by municipalities. Steel and aluminum cans, glass and PET bottles have been recycled under this law since 1997. Costs of recycling are internalized by producers in product prices. All packaging and container waste will become targets for recycling beginning in 2000.

SESSION 4: ECONOMIC AND ENVIRONMENTAL EFFECTIVENESS OF EPR - PRACTICAL EXPERIENCE

John Stutz (Tellus Institute, U.S.) emphasized that when making cost comparison, all categories of costs, both private and public need to be included. Since EPR programs can be structured to include different levels of cost shifting, quantifying and comparing only private costs does not provide an accurate representation of total program costs. For instance, in Germany, EPR costs are borne fully by producers, while in France, only a portion of EPR costs are borne by producers. Dr. Stutz presented a framework for analyzing costs of EPR programs which includes developing the full costs of providing the program's waste management services; subtracting any revenues (e.g., material sales) to determine net costs; then identifying the parties responsible for the net cost and determining their cost shares. Costs borne by the national government, local waste managers, private industry, and consumers should all be accounted for.

Dr. Stutz made a few additional points related to cost shifting. First, establishing or extending a program may require broad support; and limiting the degree of cost shifting to producers may

make it easier to obtain the required political support. Also, achieving goals for waste capture and recycling or reuse often produces societal benefits such as reduced litter and lower greenhouse gas emissions. Such societal benefits may justify society being responsible for some program costs. Dr. Stutz spoke of the benefits of voluntary arrangements pointing out that the Canadian National Packaging Protocol has reduced waste significantly and that in some locales, such arrangements may elicit the most waste minimization. Dr. Stutz emphasized that in designing policy approaches to waste minimization, maximizing waste minimization, and not cost shifting itself, should be the primary goal.

Ab Stevels (Philips Consumer Electronics, The Netherlands) spoke about the importance, for all stakeholders, of assessing the cost effectiveness of electronics take-back systems given the popularity of such systems in Europe. He expressed his belief that there needs to be more of a focus on the operational effectiveness of EPR systems rather than solely dwelling on the principle and the goals. The approach for achieving the goals must be practical and efficient, and consumer's needs should be an important consideration.

He introduced a cost effectiveness measure that he termed "eco-efficiency." He defined eco-efficiency as the environmental gain per unit of cost. Environmental gain could be measured in terms of materials not going to landfill, materials recycled, and/or toxics reduced or managed. Costs should include disassembly, mechanical separation, recycling, and incineration. Mr. Stevels presented "eco-efficiency" calculations for similar products (old and new televisions) as well as for several different types of products (televisions vs. VCRs vs. audio equipment). The analysis of the same product shows that TVs designed with recycling in mind have a much higher material recycling efficiency, are much cheaper to recycle, and therefore have a far superior eco-efficiency result than old TVs that were not designed for disassembly and recycling. In comparing different product types, his calculations showed that the material characteristics of the products have a big impact on the eco-efficiency results. For example, metal dominated products (e.g., VCRs) have a reasonable recycling efficiency and a relatively low cost of recycling; whereas plastic-dominated products (e.g., audio machines) have a low recycling efficiency and a relatively high cost of recycling. Glass-dominated products (e.g., televisions) have the highest recycling efficiency and lowest recycling cost. Lastly, Mr. Stevels presented calculations comparing the eco-efficiency of recycling TVs in Italy, vs. the Netherlands, vs. Sweden. The Netherlands showed the highest eco-efficiency results.

Mr. Stevels concluded that the eco-efficiency concept can reveal valuable insights, both in terms of the effectiveness of various take-back systems as well as Design for the Environment directions.

Karin Muenk (Duales System Deutschland (DSD), Germany) gave a brief history of the DSD. It was established in 1990 by 600 companies to implement the German Packaging Ordinance. She noted that within 18 months of beginning operations in 1993, the DSD had a deficit of 1 billion DM. She cited several reasons for this deficit:

- Due to the high recycling quotas required initially and the lack of adequate time to set

up the 540 contracts needed with municipalities and waste handlers to implement the system, contracts executed with haulers and processors were very expensive. There was not enough time for competitive bidding.

- There were many free riders. Thus, DSD was handling a larger volume of packaging than had been paid for by the system participants.
- System costs had been grossly underestimated in the planning stage.

The DSD developed a restructuring plan to address the financial problems of the system. To control expenses, they renegotiated contracts with the municipalities and private disposal companies. Instead of paying for the weight of materials collected, they paid on the basis of sorted materials that met the quality criteria of the DSD. This ensured that they were only paying for packaging covered by the Ordinance and not other materials that found their way into the collection bins. Also, they limited the payments to the amount of packaging required to fulfill the yearly quotas. Lastly, the contracts with private disposal companies allowed for these partners to market collected secondary materials themselves in return for paying a lump-sum fee to DSD for the materials.

DSD also restructured license fees to strengthen revenues. They adjusted the fee structure to reflect the actual costs of recycling the various materials, which takes into account the relative volume of each material as well as the differences in processing and recycling costs. In addition, DSD increased the invoicing interval, which had been once per year, to minimize the need to finance recycling costs during the year. DSD also instituted a requirement for an independent audit of the licensing agreement. Finally, control systems to police free riders were put in place.

By the end of 1996, the DSD had eliminated its deficit. DSD would like to reduce its fees by 9.5% in 1999, allow competitive bidding of new waste management contracts, and promote the use of new cost-efficient technologies such as fully automatic sorting systems. In conclusion, Ms. Muenk expressed the DSD's belief that a private parallel collection system for packaging can be an efficient system for meeting product responsibility challenges and the existence of take back requirements has led to promising new technical developments in the field of recycling.

Margaret Walls (Victoria University, New Zealand) presented the findings of her research in cooperation with Resources for the Future on efficient and effective means of addressing solid waste disposal and upstream pollution problems associated with consumer products. Acknowledging that critics believe take-back systems are cost inefficient and voluntary systems are not environmentally effective, she proposes an upstream combination tax/subsidy (UCTS). The tax would be levied on a per unit weight basis on produced intermediate goods, such as aluminum ingot or sheets of steel. The subsidy would be granted to collectors of recyclables such as used beverage cans and old newspapers who subsequently sell the goods for reprocessing. This approach gives firms the incentive to both use less material in their products

and substitute recycled inputs for virgin inputs in production.

She believes this approach is consistent with the goals of EPR since the tax provides a partial cost shifting effect, it reduces waste, encourages lighter weight products, encourages input substitution, and addresses life-cycle pollution concerns. Further, she believes UCTS is a superior approach because transaction costs, which include startup costs, the costs of executing contracts, auditing, monitoring, etc., are much lower than with an EPR system.

Lastly, Dr. Walls discussed the potential for unit-based pricing (UBP) to cost effectively reduce waste disposal. Although UBP can achieve notable reductions in waste disposal (Walls estimates a reduction of 21.6 percent in household waste and 13 percent in total MSW), it may not achieve results of the magnitude desired by lawmakers. One advantage is that UBP does have an impact on yard and food waste, which a product tax cannot impact. A disadvantage is that it has a limited ability to differentiate charges based on the relative environmental hazards imposed by different components of the waste stream, as the UCTS system does. Also, there is no clear evidence that UBP can be effective at encouraging firms to undertake DfE since signals from unit prices to reduce product size or increase recycling are not being transmitted directly back to producers.

Kjetil Roine (University of Science and Technology, Norway) presented a theoretical analysis of the efficiency and effectiveness of the plastic packaging recovery system in Norway. The negotiated agreement governing the recovery of plastic packaging, made effective in 1995, states that producers should work for waste reduction and build a recovery system for plastic packaging that achieves 50 percent energy recovery and 30 percent material recovery of all generated waste by the end of 1999. A PRO, Plastretur AS, manages and monitors collection and recovery. The actors in the recovery chain include the PRO and collection, sorting, and processing companies. Actors outside the chain who are affected include virgin materials producers, manufacturers, disposers, and end users.

Mr. Roine calculated the economic efficiency of the recovery system as the ratio between the value added throughout the system and the costs expended to achieve that value added. He shows that when the benefits from avoided extraction of raw materials and avoided disposal costs are included, the economic efficiency result improves dramatically. He concludes that the plastic recovery system in Norway is an economically efficient way of handling packaging waste as compared to disposal. He also notes that economic efficiency follows the law of diminishing returns in that there is an exponential increase in costs while increases in gain remain linear as the recovery rate goes up.

Mr. Roine presented a framework for assessing environmental effectiveness. He notes that analysis of environmental effectiveness should include the extraction of non-renewable resources and the negative societal effects of the associated loss of material and energy. Further analysis of the optimal recovery ratio in an economic and environmental context is needed.

SESSION 5: WORKING GROUPS: ENVIRONMENTAL AND ECONOMIC IMPACTS OF VARIED APPROACHES TO DIFFERENT SECTORS, PRODUCTS OR WASTE STREAMS

This session consisted of four working groups, two addressing packaging and two addressing electronics and electrical appliances. Working groups were asked to address two questions:

- ☐ What characteristics of a product, product category or sector should be considered when designing an EPR policy?
- ☐ What elements need to be considered to help determine the economic efficiency of an EPR program (e.g., transaction costs)?

SESSION 6: WORKSHOP SUMMARY/SESSION 7: NEXT STEPS

During Session 6, participants reviewed and commented on the extended outline developed by the drafting group the prior evening. This outline summarized the issues and points made throughout all the sessions and will form the basis of chapters concerning the environmental effectiveness and economic efficiency of EPR programs in the forthcoming guidance document.

In the closing sessions, Ms. Fenerol announced that the fourth workshop would be held in Paris, France May 4th through May 6th, 1999. This workshop will have overlapping sessions with the Working Party on Pollution Prevention and Control, which is meeting beginning May 3rd. The fourth workshop will focus on:

- ☐ outstanding issues
- ☐ policy options/principles
- ☐ future outlook and directions